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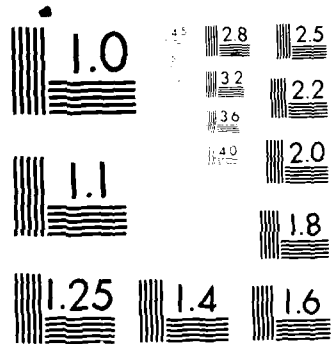
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The luminescent properties of a variety of II-VI and III-V semiconductor
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FINAL REPORT FOR CONTRACT N00014-78-C-0633
EXCITED-STATE PROPERTIES OF SEMICONDUCTOR ELECTRODES AND
THEIR APPLICATION TO OPTICAL ENERGY CONVERSION
ARTHUR B. ELLIS, PRINCIPAL INVESTIGATOR

Over the past seven years we have examined the luminescent properties of a variety of n-type II-VI and III-V semiconductor electrodes. Photoluminescence (PL) from CdS:Te, CdS_xSe_{1-x} ($0 \leq x \leq 1$), graded CdS_xSe_{1-x}, ZnSe:Al and GaAs electrodes can be quenched by applied potential in aqueous chalcogenide electrolytes. For the spatially homogeneous systems, quenching accords well with a dead-layer model: electron-hole pairs formed within a distance on the order of the depletion width do not contribute to PL. The PL quenching properties thus afford a means for mapping the electric field in the semiconductor electrode. For the graded electrodes, PL is color-coded to spatially resolve the recombination of electron-hole pairs. All of these materials also exhibit electroluminescence (EL) in aqueous peroxydisulfate electrolyte. The graded samples can be used in the construction of novel display devices exhibiting patterned, multi-colored emission. More recently, Schottky diodes, consisting of a thin layer of Pd on CdS and on graded CdS_xSe_{1-x} samples, have been prepared. The PL from these diodes is sensitive to H₂: for the CdS-based structure, PL intensity changes are in accord with the dead-layer model; for the graded CdS_xSe_{1-x}-based structure, the spectral distribution is altered. These effects can be exploited for optically-coupled chemical sensing using fiber optics.

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PUBLICATIONS, TECHNICAL REPORTS, AND PATENTS FROM CONTRACT
N00014-78-C-0633. ARTHUR B. ELLIS, PRINCIPAL INVESTIGATOR

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Tellurium-Doped Cadmium Sulfide Photoelectrodes to Probe
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Electroluminescence", U.S. Patent 4,543,511 issued 9/24/85
to A.B. Ellis and H.H. Streckert. The invention has been
assigned to the Wisconsin Alumni Research Foundation.

"Semiconductor Electrodes Having Multicolor Luminescence",
U.S. Patent Application Serial No. 480,471 filed 3/30/83
by A.B. Ellis and M.K. Carpenter. The invention has been
assigned to the 3M Co. The application has also been
filed in Canada (3/29/84), Europe (3/28/84), and Japan
(3/29/84).

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Application Serial No. 628,825 filed 7/9/84 by A.B. Ellis
and M.K. Carpenter. A Notice of Allowance was received in
9/85. The invention has been assigned to the 3M Co.

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Patent Application Serial No. 712,799 filed 3/18/85 by
A.B. Ellis and M.K. Carpenter. The invention has been
assigned to the 3M Co.

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